CLAIMS

What is claimed is:

1. A power supply comprising:

a power source providing a source voltage;

means for processing the source voltage to generate an output voltage at a Vout node, wherein the output voltage varies from the source voltage; and

a multiplicity of energy storage devices adapted to individually controllably receive energy from the Vout node.

2. The power supply of Claim 1 wherein the energy storage devices comprise a multiplicity of small capacitors.

3. The power supply of Claim 2 wherein the multiplicity of energy storage devices includes a multiplicity of switches (M4a-M4t) individually in series with the multiplicity of small capacitors, wherein each of the multiplicity of switches (M4a-M4t) and a respective small capacitor are electrically connected between the Vout node and ground, and wherein the multiplicity of switches (M4a-M4t) are controlled to independently regulate the degree to which each of the multiplicity of small capacitors is charged.

4. The power supply of Claim 1 further including a diode and a Vh node, wherein the diode is electrically connected between the Vout node and the Vh node, wherein the cathode terminal of the diode is electrically connected to the Vout node, and wherein the anode terminal of the diode is electrically connected to the Vh node, and where in the Vh node is electrically connected between the diode and the energy storage devices.

5. The power supply of Claim 1 wherein the power source comprises a battery.

6. The power supply of Claim 1 wherein the means for processing comprises a switching regulator comprising:

an inductor; and

a first switch;

wherein the inductor is electrically connected between the source voltage and the Vout node, and wherein the first switch is electrically connected between the Vout node and ground.

7. The power supply of Claim 6 wherein the energy storage devices comprise a multiplicity of small capacitors.

8. The power supply of Claim 7 further including:

a diode electrically connected between the Vout node and the Vh node; and

a multiplicity of switches (M4a-M4t) individually in series with the multiplicity of small capacitors, wherein each of the multiplicity of switches (M4a-M4t) and a respective small capacitor are electrically connected between the Vh node and ground, and wherein the multiplicity of switches (M4a-M4t) are controlled to independently determine the voltage to which each of the multiplicity of small capacitors is charged.

9. The power supply of Claim 1 wherein the means for processing comprises a switched capacitor circuit comprising a multiplicity of switched capacitors, wherein:

the multiplicity of switched capacitors are disconnectably connectable in-parallel, wherein the in-parallel multiplicity of switched capacitors are chargeable from the power source; and

the multiplicity of switched capacitors are disconnectably connectable in-series.

10. The power supply of Claim 9 wherein the energy storage devices comprise a multiplicity of small capacitors.

11. The power supply of Claim 10 further including a multiplicity of switches (M4a-M4t) individually in series with the multiplicity of small capacitors, wherein each of the multiplicity of switches (M4a-M4t) and a respective small capacitor are electrically connected between the Vout node and ground, and wherein the multiplicity of switches (M4a-M4t) are controlled to independently determine the voltage to which each of the multiplicity of small capacitors is charged.

12. An improved power supply for implantable devices, the power supply comprising:

a battery;

a control circuit;

an inductor an with input electrically connected to the battery and an output electrically connected to a node Vout;

a first switch electrically connected between the node Vout and ground, wherein the first switch is controlled by the control circuit;

a diode including a cathode side and an anode side, wherein the cathode side is electrically connected to the node Vout, and the anode side is electrically connected to a node Vh;

a multiplicity of small capacitors in parallel; and

a multiplicity of switches (M4a-M4t) in parallel, each electrically connected individually between the node Vh and one of the small capacitors, wherein the switches (M4a-M4t) are controlled by the control circuit.

13. The power supply of Claim 12 further including:

a multiplicity of Vc nodes wherein the small capacitors are electrically connected between the Vc nodes and ground; and

a multiplicity of switches (M5a-M5t), each electrically connected between a Vc node and a multiplicity of stimulation channels, wherein the switches (M5a-M5t) are adapted to be selectably connect the Vc nodes to the stimulation channels.

14. An improved power supply for implantable devices, the power supply comprising:

a battery;

a control circuit;

a multiplicity of switched capacitors adapted to be electrically configurable in parallel between the battery and ground and electrically configurable in series between ground and a node Vout, wherein the configuration of the switched capacitors is controlled by the control circuit;

a multiplicity of small capacitors in parallel; and

a multiplicity of switches (M4a-M4t) in parallel, each electrically connected individually between the node Vout and one of the small capacitors, wherein the switches (M4a-M4t) are controlled by the control circuit.

15. The power supply of Claim 14 further including:

a multiplicity of Vc nodes wherein the small capacitors are electrically connected between the Vc nodes and ground; and

a multiplicity of switches (M5a-M5t), each electrically connected between a Vc node and a multiplicity of stimulation channels, wherein the switches (M5a-M5t) are adapted to be selectably connect the Vc nodes to the stimulation channels.

16. A method for providing multi-voltage power, comprising:

providing a source voltage to a node Vs;

connecting the node Vs to a first terminal of an inductor;

connecting a voltage out node Vout to a second terminal of the inductor;

connecting a switched ground to the node Vout;

connecting a cathode terminal of a diode to the node Vout;

connecting an anode terminal of the diode to a high voltage node Vh;

connecting a multiplicity of parallel sub-circuits between the node Vh and ground, wherein each parallel sub-circuit comprises a switch, a node Vc, and a small capacitor, wherein the small capacitor is electrically connected between the switch and ground, and the node Vc is between the switch and the capacitor.

17. The method of Claim 16 further including:

selecting a group of the stimulation channels for stimulation;

assigning at least one of the parallel sub-circuits to each of the selected stimulation channels;

controlling the switch within each parallel sub-circuit, to match the voltage of node Vc to the compliance voltage of the stimulation channel that the parallel sub-circuit is assigned to; and

electrically connecting the node Vc within each parallel circuit to the stimulation channel to which the parallel sub-circuit is assigned, thereby providing stimulation.

18. The method of Claim 17 wherein selecting a group of the stimulation channels comprises selecting a group of the stimulation channels of a Spinal Cord Stimulation (SCS) system for stimulation.

19. The method of Claim 17 wherein selecting a group of the stimulation channels comprises selecting a group of the stimulation channels of an Implantable Cochlear Stimulation (ICS) system for stimulation.

20. The method of Claim 17 wherein selecting a group of the stimulation channels comprises selecting a group of the stimulation channels of a Deep Brain Stimulation (DBS) system for stimulation.

21. A method for providing multi-voltage power, comprising:

providing a source voltage to a node Vs;

disconnectably connecting a multiplicity of switched capacitors in parallel between the node Vs and ground;

disconnectably connecting the switched capacitors in series between ground and a node Vout

connecting a multiplicity of parallel sub-circuits between the node Vout and ground, wherein each parallel sub-circuit comprises a switch, a node Vc, and a small capacitor, wherein the small capacitor is electrically connected between the switch and ground, and the node Vc is between the switch and the capacitor.

22. The method of Claim 21 further including:

selecting a group of the stimulation channels for stimulation;

assigning at least one of the parallel sub-circuits to each of the selected stimulation channels;

controlling the switch within each parallel sub-circuit, to match the voltage of node Vc to the compliance voltage of the stimulation channel that the parallel sub-circuit is assigned to; and

electrically connecting the node Vc within each parallel circuit to the stimulation channel to which the parallel circuit is assigned, thereby providing stimulation.

23. The method of Claim 22 wherein selecting a group of the stimulation channels comprises selecting a group of the stimulation channels of a Spinal Cord Stimulation (SCS) system for stimulation.

24. The method of Claim 22 wherein selecting a group of the stimulation channels comprises selecting a group of the stimulation channels of an Implantable Cochlear Stimulation (ICS) system for stimulation.

25. The method of Claim 22 wherein selecting a group of the stimulation channels comprises selecting a group of the stimulation channels of a Deep Brain Stimulation (DBS) system for stimulation.